

SECTION 14

BEST CONVENTIONAL TECHNOLOGY

14.1 Introduction

Effluent limitations guidelines based on best conventional technology establish quantitative limits on the direct discharge of conventional pollutants from existing industrial point sources. In contrast to BPT guidelines, which are based on the average of the best existing performance by a group of facilities, BCT guidelines are developed by identifying candidate technologies and evaluating their cost-reasonableness. Effluent limitations guidelines based upon BCT may not be less stringent than BPT effluent limitations guidelines. As such, BPT effluent limitations are a "floor" below which BCT effluent limitations guidelines cannot be established. As discussed below, EPA has developed a BCT cost test methodology to assist the Agency in determining whether it is "cost-reasonable" for industry to control conventional pollutants at a level more stringent than would be required by BPT effluent limitations.

The following information is presented in this section:

- Section 14.2 discusses the Agency's general methodology for determining BCT effluent limitations for industry;
- Section 14.3 reviews the subcategories and pollutants proposed to be regulated by BCT, describes the application of the general BCT methodology to the pharmaceutical manufacturing industry, and presents the proposed BCT effluent limitation guidelines; and
- Section 14.4 discusses BCT effluent limitations guideline implementation.

14.2 General Methodology for BCT Effluent Limitations Development

The July 9, 1986 Federal Register (51 FR 24974) presents the Agency's general methodology for developing BCT effluent limitations guidelines. BCT effluent limitations guidelines are based on the performance of the pollution control technology selected as BCT. As noted in 51 FR 24974,

the first step in determining BCT is to establish that a BCT option is technologically feasible (defined as providing conventional pollutant control beyond the level of control provided by application of BPT). If a BCT option is found to be technologically feasible, the Agency applies a two-part BCT cost test to evaluate the "cost-reasonableness" of the BCT option. The BCT cost test consists of a POTW test and an industry cost-effectiveness test that the BCT option must pass to be considered as a basis for BCT effluent limitations guidelines. The results of these tests along with other industry-specific factors are evaluated to determine BCT. The POTW cost test, the industry cost-effectiveness test, and the process of BCT determination are discussed below.

14.2.1 POTW Cost Test

The POTW cost test compares the cost-effectiveness of an industrial treatment system upgrade to meet the BCT requirements to the benchmark cost-effectiveness of a POTW upgrade. For a BCT option to pass the POTW cost test, the cost per pound of conventional pollutant removed by upgrading from BPT to the BCT option at industrial direct dischargers must be less than the cost per pound of conventional pollutant removed by upgrading POTWs from secondary treatment to advanced secondary treatment. Specifically, the upgrade cost to industry must be less than the POTW benchmark of \$0.25 per pound (in 1976 dollars) for industries whose cost per pound is based on long-term performance data (Tier I POTW benchmark), or must be less than \$0.14 (in 1976 dollars) per pound for industries whose cost per pound is not based on long-term performance data (Tier II POTW benchmark).

As noted in 51 FR 24974, the conventional pollutants measured for removal during the two-part BCT cost test are BOD₅ and TSS. Oil and grease may be used along with BOD₅ and TSS to calculate pollutant removal for BCT options when deemed appropriate for the industry and technology being evaluated. Fecal coliform and pH are not included in the calculations because control of these pollutants is not measurable as "pounds removed". An acceptable interval for controlling pH is evaluated with respect to the particular processes of a BCT option. Generally, the acceptable pH interval for BCT will be the same as that for BPT. Maintaining the acceptable interval is an inherent cost of the BCT option and must be economically achievable and cost-reasonable (51 FR 24974).

14.2.2 Industry Cost-Effectiveness Test

To remain a viable option, a BCT option must also pass an industry cost-effectiveness test which consists of computing a ratio of two incremental costs. The first increment is the cost per pound of pollutant load removed by the BCT option relative to BPT; the second increment is the cost per pound of pollutant load removed by BPT relative to no treatment (i.e., raw wastewater). The ratio of the two incremental costs (first cost divided by the second cost) is compared to an industry benchmark. The industry benchmark is a ratio of two POTW incremental costs: 1) the cost per pound of pollutant removed for a POTW to upgrade from secondary treatment to advanced secondary treatment, and 2) the cost per pound of pollutant removed for a POTW to upgrade from no treatment to secondary treatment. If the first ratio (BCT option to BPT) is lower than the industry benchmark, the BCT option passes the industry cost-effectiveness test. The Tier I industry benchmark, for industries whose ratio is based on long-term performance data, is 1.29. The Tier II industry benchmark, for industries whose ratio is not based on long-term performance data, is 0.68.

In calculating the ratio of a BCT option to BPT, the Agency will consider any BCT option cost per pound less than \$0.01 to be equivalent to zero costs. The Agency believes that a BCT option with zero cost per pound of pollutant removed satisfies the Congressional intent for cost-reasonableness.

14.2.3 BCT Determination

BCT is determined by evaluating results of both the POTW test and the industry cost-effectiveness test as measures of cost-reasonableness. In addition, Section 304 (b)(4)(B) of the CWA instructs the Agency to consider "other factors deemed appropriate" when making BCT determinations; other factors are considered on an industry-specific basis. Generally, BCT is the most stringent technology option (i.e., the technology option that achieves the greatest pollutant reduction) to pass both parts of the cost test. If all BCT options for an industry category or subcategory fail either or both of the tests, or if no BCT option more stringent than BPT is identified, then BCT is set equal to BPT.

The owners or operators of facilities subject to BCT are not required to use the specific technologies selected by EPA to establish BCT, but may choose to use any combination of process technologies and wastewater treatment to comply with NPDES permit limitations derived from BCT effluent limitations guidelines.

14.3 BCT Effluent Limitations Guidelines Development for the Pharmaceutical Manufacturing Industry

14.3.1 Regulated Subcategories

BCT effluent limitations guidelines, as discussed in Section 7.3, are being promulgated for Subcategories A, B, C, and D.

14.3.2 Regulated Pollutants

The final BCT effluent limitations guidelines establish BOD₅ and TSS effluent limitations. The pH effluent limitation under BCT will be the equivalent of the pH limitation established by BPT.

14.3.3 Application of General BCT Methodology to the Pharmaceutical Manufacturing Industry

The Agency applied the general methodology for BCT effluent limitations guidelines development to the pharmaceutical manufacturing industry subcategories. First, technologically feasible BCT options that provide a greater degree of conventional pollutant control than BPT were identified. Section 7.3.3 describes the BCT options evaluated by the BCT determination process. After determining that the BCT options were technologically feasible, the Agency applied the two-part BCT cost test. The results of the BCT cost test were used to establish the technology basis for the final BCT effluent limitations guidelines.

The following subsections discuss the BPT baseline established for the two-part BCT cost test, the BCT options evaluated, the use of the pharmaceutical cost model to generate costs for this analysis, the two-part BCT cost test results, and the final BCT effluent limitations guidelines for the pharmaceutical manufacturing industry subcategories.

14.3.3.1 BCT Cost Test Baseline

To apply the two-part BCT cost test to the pharmaceutical manufacturing industry, a baseline technology representing the current BPT limitations (before any revision) was defined to serve as the comparison point for the more stringent BCT options. The methodology for BCT determination (as documented in 51 FR 24974) requires that this point of comparison is BPT. Thus, the baseline technology used in the two-part BCT cost test is the current (1990) treatment level.

14.3.3.2 BCT Options

Subcategories A and C

As described in Section 7.3.3, there are four BCT technology options for Subcategories A and C beyond current treatment:

- Advanced Biological Treatment;
- Advanced Biological Treatment and Effluent Filtration;
- Advanced Biological Treatment and Polishing Pond; and
- Advanced Biological Treatment and Effluent Filtration and Polishing Pond.

Subcategories B and D

As described in Section 7.3.3, there are two BCT technology option for Subcategories B and D beyond current treatment:

- Advanced Biological Treatment; and
- Advanced Biological Treatment and Effluent Filtration.

14.3.3.3 Pharmaceutical Manufacturing Cost Model

The Agency used the pharmaceutical manufacturing cost model (described in Section 10) to calculate baseline conventional pollutant control costs and corresponding costs for the BCT options. The annualized conventional pollutant control costs for the baseline and BCT options are calculated in 1990 dollars.

14.3.3.4 BCT Cost Test Results

Table 14-1 summarizes the results of the two-part BCT cost test for Subcategory A and C direct dischargers. Table 14-2 summarizes the results of the two-part BCT cost test for Subcategory B and D direct dischargers. All results are based on the use of long-term performance (i.e., Tier I) data. Results of the POTW cost test and the industry cost-effectiveness test are discussed below.

POTW Cost Test Results

Results of the POTW cost test are summarized in the upper portion of Tables 14-1 and 14-2. For Subcategory A and C direct dischargers, one BCT option passed the POTW cost test (BPT baseline to advanced biological treatment). For Subcategory B and D direct dischargers, all BCT options failed the POTW cost test.

As an example of POTW test application, consider the first BCT option for Subcategory A and C direct dischargers. The cost of upgrading from the BPT baseline (current treatment) to the BCT

option (advanced biological treatment) is \$2,190,000 per year (in 1990 dollars). The load reduction of BOD₅ and TSS achieved by upgrading to the BCT option is 3,940,000 lbs/yr. Thus, upgrading from the BPT baseline to the BCT option results in a ratio of 0.557 \$/lb (dollars expended to pounds of BOD₅ and TSS removed). This ratio is less than the Tier I POTW benchmark (in 1990 dollars) of 0.56 \$/lb. (The POTW benchmark of 0.56 \$/lb, expressed in 1990 dollars, was calculated using the May 1986 promulgated methodology entitled BCT Benchmarks: Methodology, Analysis and Results for Calculating and Indexing BCT POTW Benchmarks to Various Years' Dollars (1).) Since the cost per pound of pollutant removed is less than the POTW benchmark, this BCT option for Subcategory A and C direct dischargers passed the POTW cost test.

Industry Cost-Effectiveness Test Results

Results of the industry cost-effectiveness test are presented in the lower portion of Tables 14-1 and 14-2. For Subcategory A and C direct dischargers, all BCT options failed the industry cost-effectiveness test. For Subcategory B and D direct dischargers, all BCT options failed the industry cost-effectiveness test.

As an example of industry cost-effectiveness test application, consider the first BCT option for Subcategory A and C direct dischargers. From the POTW test, the incremental cost per pound of pollutant removed associated with upgrading from the BPT baseline to the BCT option was 0.557 \$/lb. The cost of upgrading from no treatment (i.e., raw wastewater) to the BPT baseline is \$25,800,000 per year (in 1990 dollars). The load reduction of BOD₅ and TSS achieved by upgrading from no treatment to the BPT baseline is 97,800,000 lbs/yr. Thus, the incremental cost per pound of pollutant load removed for Subcategory A and C direct dischargers upgrading from no treatment to the BPT baseline is 0.264 \$/lb. The ratio of these two incremental costs is 2.11 (i.e., 0.557 divided by 0.264). Since this ratio (2.11) is greater than the industry benchmark of 1.29, the BCT option failed the industry cost-effectiveness test.

14.3.3.5 Conclusions

Based on the results of the two-part BCT cost test and the criteria discussed in Section 14.1.3 for BCT determination, the final BCT effluent limitations guidelines for Subcategory A and C and Subcategory B and D direct dischargers are equal to BPT limitations for BOD₅ and TSS for those subcategories.

Table 14-1

**Summary Results of BCT Cost Test for Subcategory A and C Direct Dischargers
(Monetary Values are 1990 \$)**

	POTW Cost Test			
	BPT Baseline to Advanced Biological Treatment	BPT Baseline to Advanced Biological Treatment and Effluent Filtration	BPT Baseline to Advanced Biological Treatment and Polishing Pond	BPT Baseline to Advanced Biological Treatment and Effluent Filtration and Polishing Pond
Annualized Cost for BOD & TSS Reduction (\$/yr.)	2,190,000	4,060,000	19,700,000	23,000,000
BOD & TSS Load Red. (lbs./yr.)	3,940,000	4,860,000	5,400,000	7,060,000
(\$/lb.)	0.557	0.836	3.64	3.27
POTW Benchmark (\$/lb.) 1990 \$	0.56	0.56	0.56	0.56
Pass/Fail	Pass	Fail	Fail	Fail
	Industry Cost - Effectiveness Test			
	Raw WW to BPT Baseline	Raw WW to BPT Baseline	Raw WW to BPT Baseline	Raw WW to BPT Baseline
Annualized Cost for BOD & TSS Reduction (\$/yr.)	25,800,000	25,800,000	25,800,000	25,800,000
BOD & TSS Load Red. (lbs./yr.)	97,800,000	97,800,000	97,800,000	97,800,000
(\$/lb.)	0.264	0.264	0.264	0.264
Ratio	2.11	3.17	13.8	12.4
Ratio Benchmark	1.29	1.29	1.29	1.29
Pass/Fail	Fail	Fail	Fail	Fail

Notes:

Baseline is set equivalent to current Treatment. The raw to baseline and baseline to BCT option costs and load reductions were developed using the pharmaceutical manufacturing cost model. These costs do not include costs for COD removal.

To adjust the POTW benchmark to 1990 dollars, the Agency used the promulgated methodology, BCT Benchmarks: Methodology, Analysis and Results, May 1986, for calculating and indexing BCT POTW benchmarks to various years' dollars (1).

Table 14-2

**Summary Results of BCT Cost Test for Subcategory B and D Direct Dischargers
(Monetary Values are 1990 \$)**

	POTW Cost Test	
	BPT Baseline to Advanced Biological Treatment	BPT Baseline to Advanced Biological Treatment and Effluent Filtration
Annualized Cost for BOD & TSS Reduction (\$/yr.)	1,580,000	2,120,000
BOD & TSS Load Red. (lbs./yr.)	236,000	267,000
(\$/lb.)	6.68	7.93
POTW Benchmark (\$/lb.) 1990 \$	0.56	0.56
Pass/Fail	Fail	Fail
	Industry Cost - Effectiveness Test	
	Raw WW to BPT Baseline	Raw WW to BPT Baseline
Annualized Cost for BOD & TSS Reduction (\$/yr.)	2,110,000	2,110,000
BOD & TSS Load Red. (lbs./yr.)	1,300,000	1,300,000
(\$/lb.)	1.63	1.63
Ratio	4.10	4.87
Ratio Benchmark	1.29	1.29
Pass/Fail	Fail	Fail

Notes:

Baseline is set equivalent to current Treatment. The raw to baseline and baseline to BCT option costs and load reductions were developed using the pharmaceutical manufacturing cost model. These costs do not include costs for COD removal.

To adjust the POTW benchmark to 1990 dollars, the Agency used the promulgated methodology, BCT Benchmarks: Methodology, Analysis and Results, May 1986, for calculating and indexing BCT POTW benchmarks to various years' dollars (1).

REFERENCES

1. U.S. EPA. BCT Benchmarks: Methodology, Analysis, and Results for Calculating and Indexing BCT POTW Benchmarks to Various Year's Dollars. U.S. Environmental Protection Agency, Washington, D.C., May 1986.